

Appendix B

TRAFFIC IMPACT ANALYSIS AGUA HEDIONDA LAGOON NORTH JETTY RESTORATION PROJECT CARLSBAD, CALIFORNIA

**TRAFFIC IMPACT ANALYSIS
AGUA HEDIONDA LAGOON
NORTH JETTY RESTORATION PROJECT
CARLSBAD, CALIFORNIA**

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INTRODUCTION

The following traffic study has been prepared to determine and evaluate the potential traffic impacts on the local circulation system due to the construction traffic, which will occur due to the proposed Agua Hedionda Lagoon North Jetty Restoration project. The project will construct a 200-foot long seaward extension of an existing 378-foot long jetty located offshore of the City of Carlsbad. **Figure 1** shows the general vicinity of the project. **Figure 2** shows a more detailed project area map.

Included in this traffic analysis is:

- Project Description;
- Existing street system;
- Existing traffic volumes;
- Project traffic generation/distribution/assignment;
- Significance Criteria;
- Traffic Analysis methodology;
- Intersection analysis;
- Freeway Ramp operations; and
- Significance of impacts/Mitigation measures.

PROJECT DESCRIPTION

The project proposes to build a 200-foot long seaward extension of an existing 378-foot long jetty located on the north side of the northern inlet to the Agua Hedionda lagoon. The project site is located on the west side and just south of the Tamarack Avenue/Carlsbad Boulevard intersection in the City of Carlsbad.

The construction is to be carried out over a three-month period. During this time, construction traffic is expected to utilize the west leg (the existing parking lot) of the Tamarack Avenue/Carlsbad intersection to access the construction site. Trucks will bring in raw materials (stones) to the construction site, unload the materials and proceed back to a quarry and reload. Construction truck trips will occur only on weekdays, with a total

Insert Figure 1, Vicinity Map

Insert Figure 2, Project Area Map

of approximately 30 round trips expected per day (15 in and 15 out). The duration of the construction truck trips is expected to last approximately 3 months.

EXISTING STREET SYSTEM

The following is a description of the roadways in the project area. **Figure 3** shows an existing conditions diagram.

Interstate 5 (I-5) is a north-south facility, which extends from the United States/Mexico border, the length of California and beyond. In the project vicinity, I-5 provides four thru lanes in each direction, with a full diamond interchange at Tamarack Avenue. The posted speed limit is 65 miles per hour.

Tamarack Avenue is classified as a Collector street on the City of Carlsbad Circulation Plan within the project area. Tamarack Avenue is a rolling (non-level) roadway currently constructed as a two-lane roadway separated by a Two-Way Left-Turn Lane (TWLTL) median. Bike lanes and bus stops are provided on both sides of the road. Curbside parking is generally permitted and the posted speed limit is 30mph.

EXISTING TRAFFIC VOLUMES

Manual AM and PM peak hour traffic counts were conducted on Wednesday, September 19th, 2001 by Linscott, Law & Greenspan Engineers (LLG) at the following key intersections.

- Tamarack Avenue/I-5 Northbound ramps
- Tamarack Avenue/I-5 Southbound ramps
- Tamarack Avenue/Carlsbad Boulevard

Figure 4 shows the existing AM and PM peak hour traffic volumes. **Appendix A** contains copies of the intersection manual count sheets.

Insert Figure 3, Existing Conditions Diagram

Insert Figure 4, Existing Traffic Volumes AM/PM Peak Hours & ADT

PROJECT TRAFFIC GENERATION

There are no published generation rates specifically for this type of project. Therefore, the number of construction related trips to be generated by the proposed project was estimated based on the number of truck trips per day multiplied by a passenger car equivalence (PCE) factor.

Passenger Car Equivalence (PCE) is defined as the number of passenger cars that are displaced by a single heavy vehicle of a particular type under the prevailing traffic conditions. Heavy vehicles have a greater traffic impact than passenger cars since: (1) they are larger than passenger cars, and therefore, occupy more roadway space; and (2) their performance characteristics are generally inferior to passenger cars, leading to the formation of downstream gaps in the traffic stream (especially on upgrades) which cannot always be effectively filled by normal passing maneuvers. All project-generated traffic consists of heavy vehicles (trucks). Therefore, a PCE factor was applied to the generated truck trips.

Exhibit 21-8, Passenger Car Equivalents on Extended General Highway Segments, Highway Capacity Manual, 2000 (**Appendix B**) depicts Passenger Car Equivalence for various types of vehicles. As seen in Exhibit 21-8, the passenger car equivalent is 2.5 for normal trucks on rolling terrain. However, considering the large size trucks being used, LLG adopted a conservative PCE factor of 5.0.

Table 1 shows the traffic generation calculations for the proposed project. The project is calculated to generate 150 daily trip ends (75 in and 75 out) with 15 inbound/15 outbound trips during the AM peak hour and 15 inbound/15 outbound during the PM peak hour. It was conservatively assumed that 1/3 of the truck trips would occur during the AM and PM peak hours.

PROJECT TRAFFIC DISTRIBUTION/ASSIGNMENT

The project-generated traffic was distributed to the street system based on a pre-determined haul route, which assigns all the truck traffic to/from the north. Trucks would come from the east via SR 78, proceed onto I-5 south, exit on Tamarack Avenue and head west toward the project site in the City of Carlsbad. The return trip would be a reversal of this same haul route. **Figure 5** shows the construction traffic volumes. **Figure 6** shows the existing + construction traffic volumes.

TABLE 1
TRIP GENERATION SUMMARY

ONE-WAY TRUCKS	ROUND TRIPS (ADT)	PCE VALUE	AM PEAK HOUR		PM PEAK HOUR	
			IN	OUT	IN	OUT
15	30	150 ¹	15 ²	15 ²	15 ²	15 ²

NOTES:

Trips are considered one way movements.

LOS=Level of Service

1. PCE Value of 5.0 utilized based on the Highway Capacity Manual.
2. 3 trucks assumed during the AM and PM peak hours, 15 with PCE applied.

Insert Figure 5, Construction Traffic Volumes AM/PM Peak Hours & ADT

Insert Figure 6, Existing + Construction Traffic Volumes AM/PM Peak Hours & ADT

SIGNIFICANCE CRITERIA

For the purposes of this traffic study, the impact of the project is considered to be significant if the additional traffic degrades the intersection operations from LOS D or better to LOS E or LOS F.

TRAFFIC ANALYSIS METHODOLOGY

The traffic analysis assesses the key signalized intersections in the project area. The following is an explanation of the signalized intersection methodology.

The signalized intersections were analyzed by determining the average delay per vehicle entering the intersection. The delay was determined using a computer program, which utilizes the methodology found in Chapter 9 of the 2000 HCM. The delay values (seconds) were qualified by giving a Level of Service or “Grade” to the corresponding delay values for the intersection as a whole. Levels of Service for signalized intersections vary from A (free flow, little delay) to F (very congested conditions). **Table 2** shows a summary of the signalized intersection operations. **Appendix C** contains a full description of the intersection LOS thresholds and the signalized intersection calculation sheets.

The following is a description of the existing and existing + construction traffic street system operations.

EXISTING OPERATIONS

Table 2 shows a summary of the existing operations at the key signalized intersections in the project area during the AM and PM peak hours. This table shows that all key intersections are calculated to currently operated at LOS D or better.

EXISTING + CONSTRUCTION TRAFFIC OPERATIONS

Table 2 shows a summary of the signalized intersection operations in the project area with the addition of project traffic. This table shows that all the intersections are calculated to continue to operate at LOS D or better during both peak hours with the addition of construction traffic. The delays increase slightly.

TABLE 2
SIGNALIZED INTERSECTION OPERATIONS

INTERSECTIONS	PEAK HOUR	EXISTING		EXISTING+CONSTRUCTION TRAFFIC	
		DELAY	LOS	DELAY	LOS
Tamarack Avenue/Carlsbad Boulevard	AM	27.5	C	28.2	C
	PM	28.5	C	30.3	C
Tamarack Avenue/I-5 SB Ramps	AM	28.7	C	29.6	C
	PM	29.4	C	30.0	C
Tamarack Avenue/I-5 NB Ramps	AM	33.5	C	33.9	C
	PM	45.6	D	46.6	D

NOTES:
DELAY is measured in seconds
LOS=Level of Service

SIGNALIZED
DELAY/LOSTHRESHOLDS

<u>DELAY</u>	<u>LOS</u>
0.0 ≤ 10.0	A
10.1 to 20.0	B
20.1 to 35.0	C
35.1 to 55.0	D
55.1 to 80.0	E
> 80.1	F

**TABLE 3
FREEWAY RAMP INTERSECTION ANALYSIS
ILV METHOD**

INTERSECTIONS	PEAK HOUR	EXISTING		EXISTING+CONSTRUCTION TRAFFIC	
		ILV	STATUS	ILV	STATUS
I-5 SB Ramps/Tamarack Avenue	AM	1033	UNDER CAPACITY	28.2	UNDER CAPACITY
	PM	710	UNDER CAPACITY	30.3	UNDER CAPACITY
I-5 NB Ramps/Tamarack Avenue	AM	1018	UNDER CAPACITY	33.9	UNDER CAPACITY
	PM	1282	UNDER CAPACITY	46.6	NEAR CAPACITY

NOTES:

ILV VALUE – Intersection Lane Volumes per hour

STATUS	
$\leq 1,200$ ILV/HR	UNDER CAPACITY
$> 1,200$ but $\leq 1,500$ ILV/HR	NEAR CAPACITY
$> 1,500$ ILV/HR	OVER CAPACITY

FREEWAY RAMP OPERATIONS

The I-5 freeway ramp intersections were also analyzed utilizing the Caltrans Intersecting Lane Volume (ILV) methodology since Caltrans prefers this methodology. The ILV sums the critical intersecting lane volumes and compares this value to a threshold capacity. **Appendix D** shows the freeway ramps calculation sheets using the ILV method. **Table 3** shows a summary of the signalized ramp operations using the ILV method.

As shown in Table 3, the state-owned signalized ramp intersections are calculated to operate under or near capacity in the existing and existing + construction traffic scenarios.

SIGNIFICANCE OF IMPACTS/MITIGATION MEASURES

The project is calculated to generate 150 daily trip ends (75 in and 75 out) with 15 inbound/15 outbound trips during the AM peak hour and 15 inbound/15 outbound trips during the PM peak hour, with a PCE factor applied, for the duration of the 3-month construction period. The actual number of trucks is only 15 round trips per day (30 ADT). The relatively small amount of traffic is calculated to not significantly impact the intersections in the study area based on the established significance criteria. Therefore, no mitigation measures are necessary.

Insert Appendix B, Sub-Appendix A: Manual Traffic Counts

Insert Appendix B, Sub-Appendix B: Exhibit 21-8: Passenger Car Equivalents

Insert Appendix B, Sub-Appendix C: Signalized Intersection Analysis Sheets

Insert Appendix B, Sub-Appendix D: Freeway Ramp ILV Analysis Sheets